

Heligoland), R. D. Abell, B.Sc. (University of Leipzig), W. Caldwell, B.A. (University of Würzburg), W. B. McLean, B.Sc. (Owens College, Manchester), B. D. Steele, B.Sc. (University of Breslau), E. J. Butler, M.B. (University of Freiburg), J. W. Mellor, B.Sc. (Owens College, Manchester), L. N. G. Filon, M.A. (King's College, Cambridge). Four scholarships granted in 1898 have been exceptionally renewed for a third year. These scholars and their places of study are:—Dr. A. H. Reginald Buller, B.Sc. (University of Munich), H. T. Calvert, B.Sc. (University of Leipzig), R. L. Wills, B.A. (Cavendish Laboratory, Cambridge), E. H. Archibald, M.Sc. (Harvard University).

SCIENTIFIC SERIALS.

*American Journal of Mathematics*, vol. xxii. No. 3.—On continuous binary  $\Lambda$  linearoid groups, and the corresponding differential equations and  $\Lambda$  functions, by E. J. Wilczynski. In a previous paper (vol. xxi. 2) the writer has shown that, corresponding to every group of the form

$$\eta_i = \sum_{k=1}^m \phi_{ik}(x; a, \dots a_r) y_k(1),$$

where the  $r$  parameters  $a_i$  are essential, there exists a system of differential equations of order  $r$ , whose general solutions are given by (1), if  $y_1, \dots, y_n$  form a fundamental system. The functions  $\phi_{ik}$  were supposed to be uniform functions of  $x$ , and it was found that, if the parameters  $a_i$  were properly chosen,  $\phi_{ik}$  were uniform functions of the parameters also. In the present paper he discusses these groups, the corresponding differential equations, and their solutions for the case when  $n = 2$ . Dr. Lovett, in his note on a property of lines in  $n$ -dimensional space, working on the lines of Cesàro's "Lezioni di Geometria Intrinseca," shows that a line of multiple curvature cuts its osculating space of highest dimensions, or lies wholly on one side of that space, according as the number of dimensions of the space necessary to the existence of the curve is odd or even.—Concerning the cyclic sub-groups of the simple group  $G$  of all linear fractional substitutions of determinant unity in two non-homogeneous variables with coefficients in an arbitrary Galois field, by Dr. L. E. Dickson (read before the Chicago section of the Mathematical Society, December 1899), leads to a generalisation to the GF[ $\rho^n$ ] of results due to Prof. W. Burnside ("On a Class of Groups defined by Congruences," *Proc. of London Math. Soc.* vol. xxvi.). Variations from Burnside's method of treatment are introduced, partly to avoid the separate treatment of the cases  $d = 1$  and  $d = 3$ , and to take in the exceptional cases  $\rho = 2$  and  $\rho = 3$ , and to reduce the calculations; and further, on the other hand, to amplify some of the proofs. A few errors are also pointed out and amended.—On some invariant scrolls in collineations which leave a group of five points invariant, by V. Snyder. The writer gives numerous references to memoirs in which the quadric surfaces which are left invariant by cyclical collineations have been exhaustively treated. There is another simple series of scrolls, viz. those contained in a linear congruence, which have not been considered, except one form noticed by Ameseder. The writer confines his attention to such surfaces. There are six collineations which are of essentially different type, which project a set of five points into themselves without leaving every point invariant. In the notation of substitution-groups these may be thus represented:

$$\begin{aligned} T_2 &\equiv (A_1 A_2)(A_3)(A_4)(A_5), \\ T_3 &\equiv (A_1 A_2)(A_3 A_4)(A_5), \\ T_4 &\equiv (A_1 A_2 A_3)(A_4)(A_5), \quad T_5 \equiv (A_1 A_2 A_3)(A_4 A_5), \\ T_6 &\equiv (A_1 A_2 A_3 A_4)(A_5) \text{ and } T_7 \equiv (A_1 A_2 A_3 A_4 A_5). \end{aligned}$$

—On the reduction of hyperelliptic integrals ( $\rho = 3$ ) to elliptic integrals by transformations of the second and third degrees, by W. Gillespie. The point of the paper is an application of cubic involution to the problem of the reduction to elliptic integrals, of hyperelliptic integrals of genus  $\rho = 3$  and of the first kind, by a rational transformation of the third degree. It is a continuation of Prof. Bolza's researches on the cubic transformation ("Die Cubische Involution und Dreitheilung, &c.," and "Zur Reduction Hyperelliptischer Integrals, &c.," *Math. Ann.*, Bd. 50, pp. 68 and 314).—The closing paper, by Dr. E. H. Moore, was read before the American Mathematical Society at the Buffalo meeting of the summer of 1896, and is entitled "The Cross-ratio Group

of  $n!$  Cremona Transformations of Order  $n - 3$  in Flat Space of  $n - 3$  Dimensions."

*Bulletin of the American Mathematical Society*, July.—Some remarks on tetrahedral geometry, by Dr. Timerding, is a paper read at the June meeting. Several properties of a tetrahedral complex are given, viz. the pole curves of such a complex of lines form again another such complex among the cubic space curves circumscribed about the fundamental tetrahedron, the complex curves of such a complex of lines form another tetrahedral complex, &c.—Prof. H. B. Newson's paper on singular transformations in real projective groups was read at the April meeting. It treats of transformations in real projective groups which can not be generated from the real infinitesimal transformations of certain continuous groups. The discussion, which is limited to one and two dimensions, can be readily extended to three and higher dimensions.—Miss Schottenfels, in a paper read at the June meeting, writes on groups of order  $8! / 2$ , and gives a simple proof of a correspondence established by Dr. Dickson (*Proc. of London Math. Soc.*, vol. xxx.).—Prof. F. S. Woods continues his notes on Lobachevsky's geometry.—Prof. Pierpont reviews H. Burkhardt's "Functionen-theoretische Vorlesungen" (vol. ii. "Elliptische Functionen").—A "correction," notes, new publications, list of papers read before the Society, with references to the places of their publication, and a full index, complete the sixth volume of the second series.

*Annalen der Physik*, No. 7.—Dispersion of electricity in air, by J. Elster and H. Geitel. Since the sun's rays contain ultra-violet light before they impinge upon the atmosphere, this light must ionise the upper strata, and the ions produced will be gradually distributed through the whole of the atmosphere by diffusion and convection. Hence the atmosphere will contain stray ions of both signs, but chiefly negative ones in the lower strata, owing to their superior mobility. The presence of these ions can be made evident by an electroscopes.—Influence of slight impurities upon the spectrum of a gas, by P. Lewis. Very small quantities of hydrogen and nitrogen considerably affect the spectra of helium and argon, but the reverse is not the case.—Fluorescence and phosphorescence in the electric discharge through nitrogen, by P. Lewis. When nitrogen prepared from ammonium nitrate and sulphate, and purified over hot copper is pumped through an H-shaped vacuum tube, the whole wall of the tube shows a brilliant fluorescence lasting a few seconds, which extends for a length of about a yard into the supply and exhaust tubes. The light can be made permanent by keeping the pump at work and thus supplying a continuous stream of fresh nitrogen. Spectroscopic examination shows that the fluorescence is dependent upon the presence of a number of bands in the extreme ultra-violet, due to a combination of nitrogen with a trace of oxygen.—Production of very high notes by Galton's whistle, by M. T. Edelmann. The author gives tables for the pitches of pipes of various dimensions, and instructions how to test the pipes by Kundt's dust figures. He has succeeded in constructing a pipe of only 2 mm. diameter, which gives the enormously high pitch of 170,000 complete vibrations per second, or over two octaves beyond the extreme limit of audibility.—The magnetic force of the atoms, by R. Lang. Magnetism is accounted for by the revolutions of negative about positive electrons.—The air thermometer at high temperatures, by L. Holborn and A. Day. The authors further investigate the properties of the air thermometer consisting of a platinum-rhodium vessel filled with nitrogen, and compare its indications with that of a platinum-iridium thermo-couple, paying particular attention to their regular expansion of the vessel. The corrected value for the melting point of gold is 1064° C.—Difference of temperature between the surface and the interior of a radiating body, by F. Kuribbaum. A method is given of determining this difference of temperature by means of two bolometers exposed symmetrically to different surfaces of the same black partition.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, June 14.—"Data for the Problem of Evolution in Man. V. On the Correlation between Duration of Life and the Number of Offspring." By Miss M. Beeton, G. U. Yule, and Karl Pearson, F.R.S., University College, London.